

forming an upper electrically conductive film on the annealed tantalum oxide film.

4. The method according to claim 3, wherein said metal-based material is selected from ruthenium, tungsten, aluminium, platinum, tungsten nitride, titanium nitride, and titanium silicon nitride.

5. A method of manufacturing a capacitor having a tantalum oxide film as insulating film, said method comprising:

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Year	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063	2064	2065	2066	2067	2068	2069	2070	2071	2072	2073	2074	2075	2076	2077	2078	2079	2080	2081	2082	2083	2084	2085	2086	2087	2088	2089	2090	2091	2092	2093	2094	2095	2096	2097	2098	2099	2100
1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063	2064	2065	2066	2067	2068	2069	2070	2071	2072	2073	2074	2075	2076	2077	2078	2079	2080	2081	2082	2083	2084	2085	2086	2087	2088	2089	2090	2091	2092	2093	2094	2095	2096	2097	2098	2099	2100	

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annealing the tantalum oxide film at a temperature lower than a crystallization temperature of tantalum oxide by 10°C to 80°C in an inert atmosphere;

forming an upper electrically conductive film on the tantalum oxide film treated with the active oxygen species.

7. The method according to claim 5, wherein said lower electrically conductive film is formed of a metal-based electrically conductive material.

8. The method according to claim 7, wherein said metal-based material is selected from ruthenium, tungsten, aluminium, platinum, tungsten nitride, titanium nitride, and titanium silicon nitride.

a first vapor-phase deposition step of vapor-phase depositing a first tantalum oxide film on a lower electrically conductive film;

a first annealing step of annealing the first

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tantalum oxide film at a temperature lower than the crystallization temperature of tantalum oxide by 10°C to 80°C in an inert atmosphere;

5 a first treatment step of treating the annealed first tantalum oxide film with active oxygen species;

a second vapor-phase deposition step of vapor-phase depositing a second tantalum oxide film on the first tantalum oxide film treated with active oxygen species;

10 a second treatment step of treating the second tantalum oxide film with active oxygen species;

a second annealing step of annealing the second tantalum oxide film treated with the active oxygen species, within a temperature range between a
15 temperature lower than the crystallization temperature of tantalum oxide by 10°C to 80°C and a temperature at which the tantalum oxide crystallizes, in an inert atmosphere; and

20 a step of forming an upper electrically conductive film on the annealed second tantalum oxide film;

wherein the step of forming the second tantalum oxide film, the subsequent second treatment with active species and the second annealing step are conducted sequentially at least once, before the formation of the
25 upper conductive film.

10. The method according to claim 9, wherein said first annealing step is conducted at a temperature of

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about 620°C to about 690°C.

11. The method according to claim 9, wherein said second annealing step is conducted at a temperature of about 650°C to about 750°C.

12. The method according to claim 9, wherein said lower electrically conductive film is formed of a metal-based electrically conductive material.

13. The method according to claim 12, wherein said metal-based material is selected from ruthenium, tungsten, aluminium, platinum, tungsten nitride, titanium nitride, and titanium silicon nitride.

14. The method according to claim 9, wherein said step of forming the second tantalum oxide film, said second treatment with active species and said second annealing step are conducted sequentially twice or more.